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IN THE UNITED STATES DEPARTMENT OF COMMERCE  
PATENT AND TRADEMARK OFFICE

#14  
8  
8/1/03

Applicants: Hancock, Dennis, et al  
Title: MULTIPLE BASE HOLDER SYSTEM  
Application No: 10/035,290  
Filing Date: 01/03/02  
Art Unit: 4632  
Examiner: Szunny, Jonathan

RECEIVED  
JUL 22 2003  
GROUP 3600

APPEAL BRIEF

07/21/2003 RMEBRAHT 00000053 10035290  
02 FC:2402 160.00 DP

(1) *Real Party in Interest:*

Applicants/Appellants are the real parties in interest.

(2) *Related Appeals and Interferences:*

There are no related appeals and interferences.

(3) *Status of Claims:*

The application was filed with Claims 1-8. A copy of the Claims 1-8 as filed, is attached as EXHIBIT "A".

The Examiner, by the action dated July 8, 2002 required election between claims directed to Group I: Figs. 8 and 9 and Group II: Figs. 10 and 11.

During a telephone conversation, the inventor, Dennis Hancock, on July 21, 2002 made a provisional election without traverse to prosecute the invention of Group I, Claims 1-7. Claim 8 was then withdrawn from further consideration by the Examiner, under 37 C.F.R. 1.142(b), as being drawn to a non-elected invention.

In the same action, the Examiner objected to Claim 4 as being informal. Also, Claims 3-7 were rejected under 35 U.S.C. 112, 1<sup>st</sup> paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relative art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claims 1-7 were further rejected under 35 U.S.C. 112, 2<sup>nd</sup> paragraph, as being indefinite "for failing to particularly point out and distinctly claim the subject matter, which applicant regards as the invention".

Claims 1-2 were rejected under 35 U.S.C. 102(b) as being "anticipated by U.S. Patent No. 4, 358,080 to Wolker".

Claim 3 was also rejected under 35 U.S.C. 103(a), as being unpatentable over Wolker '080.

Applicants responded to the Patent Office action dated July 12, 2002 and confirmed the election, without traverse, of the Claims of Group I, i.e., Claims 1-7 as originally filed.

It was noted by Applicants that Claim 8 was withdrawn from further consideration until such time as an elected generic claim may be allowed.

Claims 1, 3 and 4 were amended to correct typographical errors.

Claim 1 was amended to provide a basis for the language of Claim 3 and Claims 3-7 were amended to overcome the rejection under 35 U.S.C. 112.

The Examiner, by action dated December 18, 2002 objected to the language in Claim 3.

The Examiner then rejected Claims 4-7, under 35 U.S.C. 112, 1<sup>st</sup> paragraph "as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relative art that the inventor(s), at the time the application was filed, had possession of the claimed invention".

Claims 1 and 2 were rejected under 35 U.S.C. 102(b) "as being anticipated by U.S. Patent No. 4,358,080 to Wolker".

Claim 3 was also rejected under 35 U.S.C. 103(a) "as being unpatentable over Wolker '080".

Claims 4-7 were not rejected on the cited art.

The action of December 20, 2002 was made FINAL by the Examiner.

Applicants subsequently filed a proposed amendment after final rejection and an amended proposed amendment after final rejection.

In response to the proposed amendment after final rejection and the amended proposed amendment after final rejection, the Examiner issued an advisory action stating that the Applicants' reply has overcome the objections of Claim 5 under 35 U.S.C. 112 (double inclusion) and the objection to Claim 3.

A new set of Claims 1-7, incorporating all amendments and changes thereto, since the filing of the application is attached hereto as EXHIBIT "B".

(4) *Status of Amendments:*

No amendment remains without response.

(5) *Summary of the Invention:*

This invention is a holding base system for attachment to a structure and for supporting an article in a desired position.

The system includes a base unit having a platform that includes means for attaching of the platform to a surface. An exteriorly splined shaft extends from the platform. The holding base system further includes an article holder that is mounted to the base unit. The article holder includes a splined socket to fit over and cooperate with the exteriorly splined shaft of the base unit and the article holder further includes means for securing an article to the exteriorly splined socket.

The base unit is shown generically at 22 in Figs. 1, 2, 3, 8 and 9. Each base unit has a platform 30 and means for securing the platform to a base surface. As shown in Figs. 1-3, the means for securing the base platform to a surface comprises U-bolts 46 and the nuts used with such U-bolts. The means for attaching the base platform 30 to a

surface may further include the notch 48 that will position the platform over a tubular service.

A shaft (or post) 32 projects upwardly from each platform 30 and has an upper end that is exteriorly splined at 34. As best described in the specification at page 5, lines 10 and 11, the upper end of shaft 32 has splines 34 therearound, extending parallel to a central hole 33 through the shaft 32 and platform 30. This construction is best shown in Figs. 1, 2 and 3.

An article holder is secured to each base unit.

As shown in best in Figs. 4-7, the article holder is identified generally at 24. The article holder has an interiorly splined socket 52 that fits over the splined end 34 of post 32. As clearly shown in Fig. 4, the interior spline 64 of the article holder 52 surrounds the central hole 68. As clearly stated in the specification, page 3, lines 11-14, secured holding is achieved because of the cooperating, splined post and socket. "Even though the article or article holder being attached to the holding base unit may be rotated to a desired position before the matching splined components are telescoped and bolted together".

Clearly, the splines 34 of the holding base unit 22 cooperate with the splines 64 of the article holder 24 when the article holder is positioned over the base unit.

As best seen in Figs. 4-7, the article holder 24 has a body structure including gripper straps 96 and 98 projecting upwardly and away from a resilient block 70.

The gripper straps are for the purpose of engaging an article placed on top of the resilient block 70 and a securement strap 110 is fixed to the socket 52 and extends over

the article and the gripper straps 96 and 98 to hold the gripper straps in engagement with an article so positioned.

Fig. 8 shows a pair of holding base systems coupled to a tubular member 134. Each of the holding base systems 20 includes a base unit 22 and an article holder 26. The base unit has an upstanding post 32 with splines 34 at the top end thereof and the article holder fits over the splined connection. The article holder 26 is affixed to base holding unit 22 in the same manner as article holder 24, shown in Figs. 1-7 is secured to base holding unit 22. This is explained at page 9, lines 4-8 of the specification where it is said that bolts 152 and inserted through central holes 154 through the spline shaft 32 and center hold 68 through the splined sockets 52 are tightened into nuts 156 in the counter-bores 158 of base hold unit 20 to secure the article holders to the base holding units. The splined connections between the splined sockets 52 and the splined ends 36 of post 32 projecting upwardly from a base 30 allow the angular position of the article holder being used to be turned with respect to the base unit and to allow an article to be wedged between the bifurcated arms of the article holder. Once the article holder is positioned on the base unit and the splines are telescoped together and engaged it will be apparent that the article holder cannot be rotated with respect to the base unit. Separation of the article holder from the base unit is, however, is possible by removing the bolt 150 and lifting the article holder from the post 32.

(6) *Issues:*

The issues involved are as follows:

1. Whether the subject matter described in Applicants' specification reasonable conveys to one skilled in the relevant art at the time the inventors, at the time the application was filed, had possession of the claimed invention.

2. Whether the specification taught that an article securement means, including gripper straps could be paired to comprise a pair of base units interconnected by a connector.

3. Whether the Wolker '080 patent discloses a system comprising a base unit with a exteriorly splined shaft and in addition includes an article holder having an interiorly splined socket as called for by the claims.

4. Whether Wolker '080 teaches that it would be obvious to interconnect a pair of base units with article holders respectively secured thereto. In this regard the issue further is whether it would be obvious to one of ordinary skill in the art at the time the invention was made to have included a pair of base units (inherently being interconnected via the surface) as taught by Wolker '080 "since doing so would be seen as simply a duplication of parts, and would inherently increase the utility of the system".

(7) *Grouping of Claims:*

The Examiner has grouped Claims 1 and 2 together and is apparently contending that these claims are directed only to the embodiments of the invention shown in Figs. 8-11.

The Examiner has apparently grouped Claims 4-7 as being directed to the invention shown in Figs. 8-11.



Applicants disagree with the groupings made by the Examiner for the following reasons. First, Applicants believe Claim 1 to be generic. As a generic claim, Claim 1 then reads on the invention as shown in all Figs. of the drawings.

Applicants believe Claim 2 to be directed to the invention as shown in Figs. 8-11.

Claim 3 is an independent claim and Claim 3, together with each of the Claims 4-7 are directed to the invention as shown particularly in Figs. 8-11.

Since it is believed that both independent Claims 1 and 3 are allowable and are generic, Claim 8 should also be considered, even though previously withdrawn by the Examiner. Claim 8 is directed to the invention as shown in Figs. 10 and 11 of the drawings.

(8) *Argument:*

(i) Claims 4-7 are rejected under 35 U.S.C. 112, 1<sup>st</sup> paragraph as “containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention”.

(ii) The Examiner further states that “With respect to Claim 4, neither the specification nor the drawings describe or show the system of Claim 3 including, a pair of base units connected by connector means, an article holder connected to each of the base units, angular adjusting means off the article holders relative to its perspective base unit, in addition to an article securement means on each of the article holding holders including strap means”.

The Examiner even further states that “Regarding Claim 6, it is not understood how the article securement means can include a pair of bifurcated arms if in Claim 4, the article securement means includes strap means”.

In addition, the Examiner states that “more specifically, it was never taught in the specification that article securement means includes strap means could comprise a pair of base units interconnected by a connector. The pair of base units interconnected by connector was described with respect to the bifurcated arms, not the strap means”.

(iii) Claims 1 and 2 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 4,358,080 to Wolker.

In making the rejection the Examiner contends that “Wolker ‘080 discloses a system (figs. 1-6) comprising a base unit (fig. 5) including a platform (fig. 5), a means (column 2, lines 63-64) for securing the platform and an exteriorly splined shaft (fig. 5), in addition to an article holder (fig. 1) including an interiorly splined socket (fig. 1) fitting over and cooperating with the exteriorly splined shaft and bifurcated arms (fig. 1) extending from opposite sides of the socket; wherein the bifurcated arms each have at least one flexible vane (fig. 1) extending inwardly towards an opposite one of the bifurcated arms and towards the socket; wherein the angular relationship of the article holder is adjusted relative to the base unit to which it is secured via the article holder being positioned on the base unit at the desired position of an operator”.

(iv) Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wolker ‘080.

In making the rejection the Examiner states that “Wolker ‘080 discloses a previous invention wherein the platform of the base unit is secured to a surface, but fails to specifically teach a pair of base units with article holders respectively secured thereto to be interconnected. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have included a pair of base units (inherently being interconnected via the surface), since doing so would be seen as simply a duplication of parts, and would inherently increase the utility of the system.”

The 35 U.S.C. 112, 1<sup>st</sup> Paragraph Rejection

In making the rejection, the Examiner has apparently overlooked the parts of the specification that clearly describe the invention and the interchangeability of different component parts of the system that is being claimed.

Applicants have developed an invention that will provide a holding base that is readily and easily connected to a variety of support surfaces and that will either then receive an article to be secured or a variety of clamping devices to hold articles to be secured to the support surfaces. This is set forth on page 1, lines 13-16 of Applicants’ specification. At page 2, lines 3-5, it is further stated that the invention provides a base system that may be “fitted with different types of anchor straps to pass around and tightly grip articles, secured to a support surface such as a vehicle”.

Throughout the specification the system of the invention is said to include “a pair of oppositely extending flexible gripper straps”, page 2, line 18. The flexible gripper straps are described further on page 6, last paragraph of the specification where it is said that they are integral with block 70 and with the straps each extending from an opposite edge of the block 70 and parallel to V-notch 80. Each gripper strap is formed to curve

away from the block 70 and each has raised parallel ribs 100 on once face to engage an article to be secured by the holding base system. A pair of spaced apart projections 102 and 104 are formed at opposite sides 106 and 108 of the other faces of each of the gripper straps 96 and 98 to assist in alignment of an article securement strap, such as strap 110, used to secure an article to the holding base system.

As disclosed at page 8, lines 12-17 the same base holding units may receive article holders having "bifurcated arms 138 and 140". In making his rejection, the Examiner has taken the position that "gripper straps" do not come within the terminology "bifurcated arms". As shown by the attached EXHIBIT "C", which includes a copy of page 48 of the New Webster's Dictionary, the term "bifurcate" means to "divide into two"; "to fork". Page 31 of EXHIBIT "C" is from the new Webster's Dictionary makes it clear that an "arm" is "anything projecting from a main body, as a branch". It should be clear that the term "bifurcated arms", meaning divided members by forking members, includes divided gripper straps, extending from a body. In the case of Applicants' invention as shown in Figs. 1-7, i.e., body portions 70 of the base holding unit 22, as well as the bifurcated arms as described in connection with the invention as shown in Figs. 8-11 clearly constitute bifurcated arms. The Examiner is apparently quite willing to consider elements 6 of the Wolker '080 reference to be "bifurcated arms" and it is therefore very difficult to understand why the Examiner would not consider the gripper straps disclosed by Applicants to also be bifurcated arms. The article holders disclosed by Applicants as including gripper straps further include securement straps such as are shown, for example, at 110 of Applicants' drawings.

It is apparent to anyone skilled in the art to which the invention pertains that the article holders of Applicants' disclosure are each adaptable for use with the disclosed base unit. It is also very apparent that any article holder disclosed can also be used with a pair of base units interconnected by a connector. Clearly, as disclosed, each article holder includes a socket that is interiorly splined to fit over an exteriorly splined post of a base unit. The sockets disclosed for the invention are the same throughout the entire description of the specification and drawings and the base unit is similarly described such that it is apparent that spline connections on the inside of the socket will mate with splined connections on the exterior of the post.

Consequently, it is believed that the Examiner's rejection under 35 U.S.C. 112, 1<sup>st</sup> paragraph, is in error and should be withdrawn.

#### The Rejection under 35 U.S.C. 102

In making the rejection the Examiner has relied upon Patent No. 4,358,080 to Wolker. In making the rejection, the Examiner contends that Wolker discloses a base unit (Fig. 5), including a platform (Fig. 5), and a means (column 2, lines 63-64) which apparently is welding for securing the platform and exteriorly splined shaft (Fig. 5). Wolker does not show an exteriorly splined shaft. Rather, Wolker shows a shaft 9 that is threaded. See column 1, line 16, line 43 and line 61. The threads on post 9 are further disclosed throughout the specification of the reference and are specifically mentioned again at column 4, lines 23-25. Neither does the article holder (clip) (Fig. 1) of Wolker include "an interiorly splined socket (Fig. 1) fitting over and cooperating with the exteriorly splined shaft". Rather, the Wolker '080 patent discloses an article holder with a central hole therethrough and with elements that will yield to allow the article holder to

be hammered onto the post. As the article holder moves onto the post flexible elements allow the article holder to pass over and onto the post, but the same flexible elements engage the threads on post 9 to resist pulling of the article holder from the post. However, the article holder is quite easily removed from the post, simply by rotating the article holder to follow the threads up and off the post. It is specifically stated at column 4, lines 23-25 that "if it is desired to remove the clip from the threaded pin 9 that can be achieved, simply by turning the clip in a counter-clock wise direction as viewed in Fig. 3". The relationship of the threaded pin 9 and clip of the reference is not a connection or cooperating relationship between splines on the interior of a socket and exterior of a post. Webster's New Encyclopedic Dictionary defines spline as "*A key that is fixed to one or two connected mechanical parts and fits into a keyway in the other; a keyway for such a key.*" Wolker does not have any such key or keyway for interlocking mechanical components.

Attached EXHIBIT "E" comprises pages taken from the Standard Handbook for Engineers. Applicants disclosure shows and describes external and internal individual splines that telescope together. Clearly, splined is a well known term in mechanics and does not include structure such as taught by Wolker.

Applicants clearly disclose a spaced rib structure in each of the base unit and holder unit components arranged such that the ribs will intermesh when a holder unit is positioned on a base unit. Since the splines extend fully around bolts through the components, it is very apparent that the splines can be interweaved as desired to change the angle of the holder unit relative to the base unit. This is not possible nor desirable for the device of the Wolker patent. As is disclosed in Applicants' specification, it is

desirable for the holder unit to be held against rotation with respect to the base unit if it is to serve effectively as a holder for cables or the like. The Wolker device clearly allows rotation of the holder with respect to the base unit. In fact, such rotation will remove the article holder from the base unit.

It is submitted that the Wolker '080 patent does not teach or suggest the structure claimed by Applicants and the rejection of Claims 1 and 2 should be withdrawn.

Rejection of Claims Under 35 U.S.C. 103

The rejection of Claim 3 as being unpatentable over Wolker '080, under 35 U.S.C. 103 is believed to be improper since Wolker does not disclose the claimed "means for adjusting the angular relationship of at least one of said article holders relative to the base unit to which said base holder is secured". As previously noted, Wolker teaches a clip that is positioned on a threaded post. The clip is hammered into place on the post and is free to rotate with respect to the post. Wolker is concerned that the clip not be easily pulled from the pin, but teaches that the clip can be rotated to turn the clip off the threaded pin. There is no teaching in Wolker to even suggest means provided for adjusting angular relationship as called for by Claim 3 to facilitate holding an article. Applicants' claimed means for adjusting the angular relationship comprises the interacting spline components. Applicants are unable to understand why the Examiner is apparently unwilling to consider the spline elements as being such means for changing the angular relationship. The Examiner in the final rejection notes that in Claim 3 Applicants' claim "means for adjusting the angular relationship. . . 'not' structure permitting the angular relationship" as mentioned in the remarks. This sentence does not

make sense to Applicants and Applicants are unable to determine what the Examiner means by the sentence.

Apparently, the Examiner is taking the position that any socket fitting on a post can be angularly turned relative to the post. Nevertheless, in the Wolker reference rotation of the clip to adjust the angular relationship is to destroy the usefulness of the Wolker device. Turning of the clip will throw the clip off the supporting post.

It is believed that Claim 3 and Claims 4-6 dependent therefrom are each clearly allowable. Reversal of the final rejection and allowance of Claims 1-7 on appeal is requested. Further, it is requested that generic Claim 1, if allowed, provides a basis for allowance of the withdrawn Claim 8. It is requested that Claim 8 be allowed along with Claims 1-7.

RESPECTFULLY SUBMITTED this \_\_\_\_\_ day of July, 2003.

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Dennis Hancock  
Applicant



EXHIBIT "A"

1. A holding base system comprising
  - a base unit including
    - a platform;
    - means for securing said platform to a surface;
    - an exteriorly splined shaft extending from said platform; and
    - an article holder including
      - an interiorly splined socket fitting over and cooperating with said exteriorly splined shaft; and
      - bifurcated arms extending from opposite sides of said sprocket.
2. A holding base system as in Claim 1, wherein
  - said bifurcated arms each have at least one flexible vane extending inwardly towards an opposite one of said bifurcated arms and towards said socket.
3. A holding base system as in Claim 1, further including
  - a pair of base units;
  - means interconnecting said pair of base units;
  - an article holder secured to each of said base units; and
  - means for adjusting the angular relationship of at least one of said article holders relative to the base unit to which said one article holder is secured.

4. A holding base system as in Claim 3, wherein  
said article holders each include article securement means; and wherein  
at least one of said article securement means includes strap means to pass over  
an article to be secured and to be fastened to said securement means.
5. A holding base system as in Claim 4, wherein  
at least one of said article securement means includes  
a pair of bifurcated arms.
6. A holding base system as in Claim 5, wherein  
each of said article securement means includes a pair of bifurcated arms.
7. A holding base system as in Claim 6, wherein  
each of said bifurcated arms includes at least one flexible vane extending  
towards the other of said bifurcated arms and towards the base unit to  
which the bifurcated arms are secured.

EXHIBIT "A"

1. A holding base system comprising
  - a base unit including
    - a platform;
    - means for securing said platform to a surface;
    - an exteriorly splined shaft extending from said platform; and
    - an article holder including
      - an interiorly splined socket fitting over and cooperating with said exteriorly splined shaft; and
      - bifurcated arms extending from opposite sides of said sprocket.
2. A holding base system as in Claim 1, wherein
  - said bifurcated arms each have at least one flexible vane extending inwardly towards an opposite one of said bifurcated arms and towards said socket.
3. A holding base system as in Claim 1, further including
  - a pair of base units;
  - means interconnecting said pair of base units;
  - an article holder secured to each of said base units; and
  - means for adjusting the angular relationship of at least one of said article holders relative to the base unit to which said one article holder is secured.

8. A holding base system as in Claim 1, and further including  
a cross-bar having an exteriorly splined socket fitting over and cooperating  
with said exteriorly splined shaft extending from said platform and having  
at least one exteriorly splined shaft extending therefrom; and  
at least one article holder having an exteriorly splined socket fitting over and  
cooperating with at least one exteriorly splined shaft extending from said  
cross-bar.

EXHIBIT "B"

1. A holding base system comprising
  - a base unit including
    - a platform;
    - means for securing said platform to a surface;
    - an exteriorly splined shaft extending from said platform; and
  - an article holder including
    - an interiorly splined socket fitting over and cooperating with said exteriorly splined shaft; and
    - bifurcated arms extending from opposite sides of said sprocket.
2. A holding base system as in Claim 1, wherein
  - said bifurcated arms each have at least one flexible vane extending inwardly towards an opposite one of said bifurcated arms and towards said socket.
3. A holding base system as in Claim 1, further including
  - a pair of base units;
  - means interconnecting said pair of base units;
  - an article holder secured to each of said base units; and
  - means for adjusting the angular relationship of at least one of said article holders relative to the base unit to which said one article holder is secured.

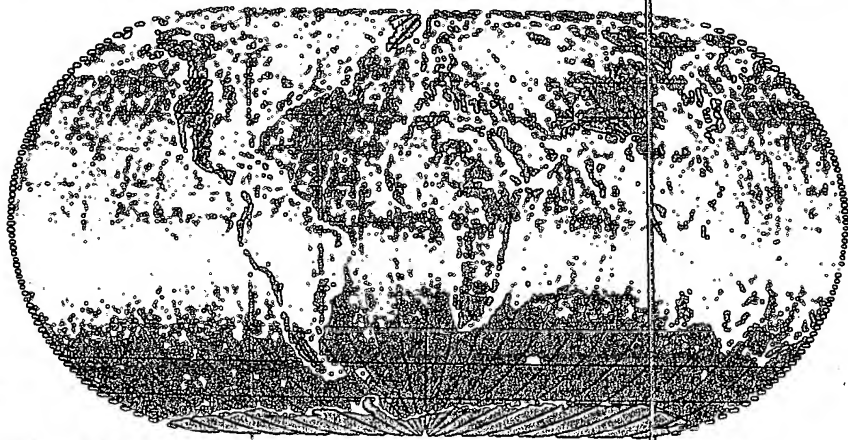
EXHIBIT "B"

1. A holding base system comprising
  - a base unit including
    - a platform;
    - means for securing said platform to a surface;
    - an exteriorly splined shaft extending from said platform; and
  - an article holder including
    - an interiorly splined socket fitting over and cooperating with said exteriorly splined shaft; and
    - bifurcated arms extending from opposite sides of said sprocket.
2. A holding base system as in Claim 1, wherein
  - said bifurcated arms each have at least one flexible vane extending inwardly towards an opposite one of said bifurcated arms and towards said socket.
3. A holding base system as in Claim 1, further including
  - a pair of base units;
  - means interconnecting said pair of base units;
  - an article holder secured to each of said base units; and
  - means for adjusting the angular relationship of at least one of said article holders relative to the base unit to which said one article holder is secured.

EXHIBIT "C"  
(3 pages)

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AND  
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- Grammar and Punctuation
- Cooking Conversions
- Presidents and Vice Presidents of the United States
- Declaration of Independence
- Indexed Guide to the Constitution
- Entry of States into the Union
- Weight and Measure





EXHIBIT "D"  
(2 pages)

# New Encyclopedic Dictionary

200,000 ENTRIES, DEFINITIONS, FACTS, AND FIGURES  
36 DICTIONARIES, GLOSSARIES AND REFERENCE WORKS IN ONE

**splay-foot** \ˈsplā-fūt, -füt\ *n* : a foot abnormally flattened and spread out : **FLATFOOT** — **splayfoot** or **splay-foot-ed** \-füt-əd\ *adj*

**spleen** \ˈsplēn\ *n* 1 : a very vascular ductless organ near the stomach or intestine of most vertebrates concerned with final destruction of blood cells, storage of blood, and production of lymphocytes 2 : **ANGER**, **MALICE** [Latin *splen*, from Greek *splēn*]

**spleen-ful** \-fəl\ *adj* : **SPLENETIC**

**spleen-wort** \-wərt, -wört\ *n* : any of a genus of ferns having linear or oblong clusters of spores borne obliquely on the upper side of the frond (from the belief in its power to cure disorders of the spleen)

**spleeny** \ˈsplē-nē\ *adj* : full of or displaying spleen

**splen-dent** \ˈsplen-dənt\ *adj* 1 : **SHINING** 1, **LUSTROUS** 2 : **ILLUSTRIOUS**, **BRILLIANT** [Late Latin *splendens*, from Latin *splendēre* "to shine"]

**splen-did** \ˈsplen-dəd\ *adj* 1 : possessing or displaying splendor: as a : brilliantly shining : **RADIANT** b : **SHOWY** 1, **MAGNIFICENT** 2 : **ILLUSTRIOUS**, **GRAND** 3 : **PRAISEWORTHY**, **EXCELLENT** [Latin *splendīdus*, from *splendēre* "to shine"] — **splen-did-ly** *adv* — **splen-did-ness** *n* □ **SYN** **SPLENDID**, **GLORIOUS**, **GORGEOUS** mean extraordinarily impressive. **SPLENDID** implies outshining the usual in brilliance or excellence; **GLORIOUS** suggests beauty and distinction heightened by radiance; **GORGEOUS** implies a rich splendor especially in display of color.

**splen-dif-er-ous** \ˈsplen-dif-rəs, -ə-rəs\ *adj* 1 : **SPLENDID** 1, **MAGNIFICENT** 2 : deceptively splendid [*splendor* + *-i-* + *-ferous*] — **splen-dif-er-ous-ly** *adv* — **splen-dif-er-ous-ness** *n*

**splen-dor** \ˈsplen-dər\ *n* 1 a : great brightness or luster : **BRILLIANCY** (the *splendor* of the sun) b : sumptuous display : **MAGNIFICENCE**, **POMP** (an affair of great *splendor*) 2 : something splendid or contributing to splendor (surrounded by *splendors* and luxuries) [Anglo-French *splendur*, from Latin *splendor*, from *splendēre* "to shine"] — **splen-dor-ous** also **splendrous** \-də-rəs, -drəs\ *adj*

**sple-net-ic** \ˈspli-net-ik\ *adj* : marked by bad temper, hatred, or spite [Late Latin *spleneticus*, from Latin *splen* "spleen"] — **sple-net-i-cal-ly** \ˈspli-net-i-kəl-ē, -klē\ *adv*

**splen-ic** \ˈsplen-ik\ *adj* : of, relating to, or located in the spleen

**splice** \ˈsplis\ *vt* 1 : to unite (as two ropes) by weaving the strands together 2 : to unite (as rails or timbers) by lapping the ends together and making them fast [obsolete Dutch *splissen*] — **splice-r** *n*

**splice** *n* : a joining or joint made by splicing

**spline** \ˈsplin\ *n* 1 : a thin wood or metal strip used in building construction 2 : a key that is fixed to one of two connected mechanical parts and fits into a keyway in the other; also : a keyway for such a key [origin unknown]

**splint** \ˈsplint\ *n* 1 a : a thin strip of wood interwoven with others incaning b : **SPLINTER** 1 c : material or a device used to protect and immobilize a body part (as a broken arm) 2 : a bony enlargement on the cannon bone of a horse [Low German *splinte*, *splente*]

**splint** *vt* : to support and immobilize with or as if with a splint or splints

**splint bone** *n* : one of the slender rudimentary bones on each side of the cannon bone in the limb of a horse

**splint-ter** \ˈsplint-ər\ *n* 1 a : a thin piece split or torn off lengthwise : **SLIVER** b : a small jagged particle 2 : a group or faction broken away from a parent body [Dutch] — **splinter** *adj* — **splint-ter-ly** \ˈsplint-ər-ē\ *adj*

**splinter** *vb* : to divide or break into splinters

**split** \ˈsplit\ *vb* **split**; **split-ting** 1 a : to divide lengthwise usually along a grain or seam or by layers : **CLEAVE** (wood that *splits* easily) [*split* slate into shingles] b : to separate the parts of by interposing something (*split* an



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**split** *adj* : divided by or as if by splitting (a *split* lip) (*split* families); also : prepared for use by splitting (*split* hides)

**split decision** *n* : a decision in a boxing match reflecting a division of opinion among the referee and judges

**split end** *n* : an offensive end in football who lines up several yards wide of the formation

**split infinitive** *n* : an infinitive with *to* having a modifier between the *to* and the verbal (as in "to really start")

**split-level** \ˈspli-lev-el\ *adj* : divided vertically so that the floor level of rooms in one part is about midway between the levels of two successive stories in an adjoining part (*split-level* houses) — **split-level** \-el, -lev-el\ *n*

**split personality** *n* : a personality structure composed of two or more groups of behavior tendencies and attitudes each expressed independently

**split rail** *n* : a fence rail split from a log

**split second** *n* : a very brief period : **FLASH**, **INSTANT** (happened in a *split second*)

**split shift** *n* : a shift of working hours divided into two or more working periods (as morning and evening)

**split ticket** *n* : a ballot cast by a voter who votes for candidates of more than one party

**split-ting** \ˈsplit-ing\ *adj* : very severe (a *splitting* headache)

**spotch** \ˈspläch\ *n* : **BLOTCH** 2, **SPOT** [perhaps blend of *spot* and *blotch*] — **spotch** *vt* — **spotchy** \ˈspläch-ē\ *adj*

**splurge** \ˈsplərj\ *n* 1 : a showy display 2 : liberal indulgence [perhaps blend of *splash* and *surge*]

**splurge** *vb* 1 : to make a showy display 2 : to indulge oneself or spend lavishly

**splut-ter** \ˈsplət-ər\ *n* 1 : a confused noise (as of hasty speaking) 2 : a splashing or sputtering sound [probably alteration of *sputter*] — **splut-ter-ly** \ˈsplət-ər-ē\ *adj*

**splutter** *vb* 1 : to make a noise as if spitting 2 : to speak or utter hastily and confusedly — **splut-ter-er** \ˈsplət-ər-ər\ *n*

**spoil** \ˈspoil\ *n* 1 a : plunder taken from an enemy in war or a victim in robbery : **LOOT** b : something won usually by effort or skill : **PREY** — usually used in pl. (the *spoils* of the chase) 2 : earth and rock excavated or dredged 3 : an object damaged or flawed in the making [Middle French *espottle*, from Latin *spolia*, pl.

# Standard Handbook for Mechanical Engineers

*Revised by a staff of specialists*

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EXHIBIT E  
(2 pages)



## SPLINES

Involute spline proportions, dimensions, fits, and tolerances are given in detail in ANSI H92.1-1970. External and internal involute splines (Fig. 8.2.31) have the same general form as

involute gear teeth, except that the teeth are one-half the depth of standard gear teeth and the pressure angle is 30°. The spline is designated by a fraction in which the numerator is the diametral pitch and the denominator is always twice the numerator.

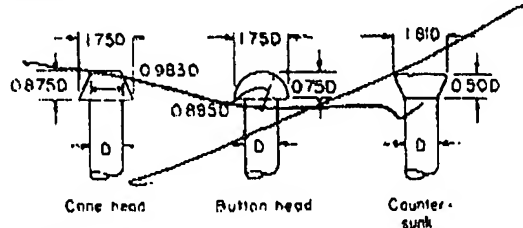


Fig. 8.2.19 Rivet heads

There are 17 series, as follows: 2.5/5, 3/6, 4/8, 5/10, 6/12, 8/16, 10/20, 12/24, 16/32, 20/40, 24/48, 32/64, 40/80, 48/96, 64/128, 80/160, 128/256. The number of teeth within each series varies from 6 to 50. Both a flat-root and a fillet-root type are provided. There are three types of fit: (1) major diameter — fit controlled by varying the major diameter of the external

spline; (2) sides of teeth — fit controlled by varying tooth thickness and customarily used for fillet-root splines; (3) minor diameter — fit controlled by varying the minor diameter of the internal spline. Each type of fit is further divided into three classes: (a) sliding — clearance at all points; (b) close — close on either major diameter, sides of teeth, or minor diameter; (c) press — interference on either the major diameter, sides of teeth, or minor diameter. Important basic formulas for tooth proportions are:

$D$  = pitch diam  
 $N$  = number of teeth  
 $P$  = diametral pitch  
 $p$  = circular pitch  
 $t$  = circular tooth thickness  
 $a$  = addendum  
 $h$  = dedendum  
 $D_o$  = major diam  
 $TIF$  = true involute form diam  
 $D_R$  = minor diam

Flat and fillet roots

$$D = N/P$$

$$p = \pi/P$$

$$t = p/2$$

$$a = 0.5000/P$$

$$D_o(\text{external}) = \frac{N+1}{P}$$

$$TIF(\text{internal}) = \frac{N+1}{P}$$

$$D_R = \frac{N+1}{P} \quad (\text{minor-diameter fits only})$$

$$TIF(\text{external}) = \frac{N-1}{P}$$

$h = 0.600/P + 0.002$  (For major-diameter fits, the internal spline dedendum is the same as the addendum; for minor

diameter fits, the dedendum of the external spline is the same as the addendum.)

Filler root only

% through %

$$D_o(\text{internal}) = \frac{N+1.8}{P}$$

$$D_R(\text{external}) = \frac{N-1.8}{P}$$

$$b(\text{internal}) = 0.900/P$$

$$h(\text{external}) = 0.900/P$$

% through %

$$D_o(\text{internal}) = \frac{N+1.8}{P}$$

$$D_R(\text{external}) = \frac{N-1.8}{P}$$

$$b(\text{internal}) = 0.900/P$$

$$h(\text{external}) = 1.000/P$$

Internal spline dimensions are basic while external spline dimensions are varied to control fit.

The advantages of involute splines are: (1) maximum

strength at the minor diameter, (2) self-centering equalizes bearing and stresses among all teeth, and (3) ease of manufacture through the use of standard gear-cutting tools and methods.

Parallel-side splines have been standardized by the SAE for 4, 6, 10, and 16 spline fittings. They are shown in Fig. 8.2.34. pertinent data are in Tables 8.2.34 and 8.2.35

The design of involute splines is critical in shear. The torque capacity may be determined by the formula  $T = L D^2 S_s / 1.2732$ , where  $L$  = spline length,  $D$  = pitch diam,  $S_s$  = allowable shear stress.

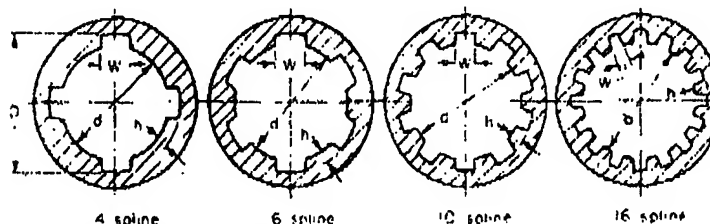


Fig. 8.2.34 Parallel-sided splines

